SELF-IMPLEMENTATION PCB REMEDIATION PLAN

PHASE I
SALEM STATE LIBRARY

360 LAFAYETTE STREET
SALEM, MASSACHUSETTS

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES & DRAWINGS

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

CFR	Code of Federal Regulations
cm^2	square centimeters
DCAM	Division of Capital Asset Management
EFI	EFI Global, Inc.
EH&E	Environmental Health & Engineering, Inc.
EPA	U.S. Environmental Protection Agency
OSHA	U.S. Occupational Safety and Health Administration
MADEP	Massachusetts Department of Environmental Protection
ng	nanograms; $1x10^{-9}$ grams
PCB	polychlorinated biphenyls
ppm	parts of PCBs per million parts of bulk material
PCB-Impacted	Materials containing greater than 1 ppm of PCB residues
SALEM	Salem State University
SIP	Self-implementation plan
Site	360 Lafayette Street
µg	micrograms; $1x10^{-6}$ grams

1.0 OVERVIEW

This Self Implementation Plan (the Plan) dated April 22, 2011 covers the dismantling and demolition of the west end of the Library at Salem State University's North Campus. The Library (Site) is located at 360 Lafayette Street and the mailing address for all correspondence is 352 Lafayette Street, which is the University's Administration Building. The work covered by this Plan complements and completes the work outlined in the Cost Removal Alternative Study Program dated February 11, 2011, which was modified on April 4, 2011and approved by the USEPA on April 13, 2011. A description of the components of the Cost-Removal Alternative Study Program is presented in Section 1.2 below.

The western portion of the Library (known as PHASE I) will be demolished to provide space for a new Library (see Figure 1, Site Locus Plan and Figure 2, Site Plan). This Plan is prepared specifically to address the remaining structural concrete impacted by PCB-containing caulk within the PHASE I Area. The comprehensive demolition will be performed in two phases; PHASE I will demolish the western section of the Library, and PHASE II will demolish the remainder of the Library. The PHASE I demolition is required for a new Library that is expected to break ground in the Spring of 2011. The PHASE II demolition will occur within the next few years and is expected to be the Site for a new science center.

DCAM elected to demolish the Library in two phases (PHASES I and PHASE II) due to widespread presence of the PCB-containing caulk and the resulting migration of PCBs into adjacent masonry (CMU, brick and concrete). This decision was based in part on the need to commence construction of the new Library in early 2011 in order to meet a new Library opening date of December 2012. The second part of the decision to have two phases was the uncertainty of the cost of the PCB remediation. Dividing the Project into two PHASEs allows DCAM to better ascertain the remediation costs during PHASE I and then extrapolate the cost for PHASE II activities. If the Cost Removal Alternative Study Program results are favorable and funding is available, the PHASE II demolition will follow immediately behind the PHASE I demolition. Figure 3 presents the areas addressed under PHASE I and PHASE II.

This Plan addresses the selected demolition and temporary storage of the structural columns and beams that are impacted by PCB-containing caulk. Large sections of the remaining structure, such as waffle slabs that comprise the ceiling and floors, and most interior columns are not impacted by PCB-containing caulk and as such are not subject to this Plan. All the exterior and interior masonry infill panels that form the building envelope and the interior walls in the western section of the Library (within the PHASE I Area) will be removed under the already approved SIP and the addendum to the SIP (Addendum #1) submitted on April 22, 2011.

The focus of this work is to only remove and relocate concrete structural components impacted by PCB caulk to the PHASE II Area of the Library so that the west section of the building may be demolished. No decontamination will be conducted under this Plan, and any PCB remediation waste generated during the work will be disposed at a TSCA-approved landfill in conformance with 40CFR§761.61(a). The columns and beams that contain PCB residues from PCB caulk, which will be treated with a sealant, will be temporarily stored in the PHASE II Area of the Library for decontamination and disposal at later date. This work will be detailed in a separate submission to the EPA under a separate cover at a later date. The only PCB remediation waste that will be generated is debris from the selective demolition of the beams and columns, and disposable personal protective equipment and environmental controls (e.g., plastic sheeting).

This Plan has been developed to provide the USEPA with background information pertaining to the Library, PCB characterization activities, an overview of the planned project details and schedule. The Plan also includes a copy of the Contractor's Work Plan that provides information on the engineering and exposure controls, work practices and performance criteria that will be used during the removal of PCB-impacted structural concrete components (see Appendix A).

1.2 PROJECT BACKGROUND

The Library is a 138,000 square foot, five-story (plus a partial Ground Level "basement") cast-in-place concrete structure with the panels between the structural columns and floor slabs infilled with concrete masonry units (CMU) and windows. A brick veneer is attached to the Library's exterior over the CMU. In addition, CMU was used to construct some interior walls. The Library has been closed since 2007 due to structural integrity concerns.

DCAM commissioned regulated materials assessments for the entire Library which included surveys for asbestos, lead paint, petroleum products, hazardous components (such as mercury-containing thermostats) and PCBs. These assessments were conducted by EFI Global, Inc. (EFI) of Wilmington, Massachusetts. Removal of all identified materials (excluding PCB containing materials) was initiated in August 2010 and was completed December 10, 2010.

DCAM commissioned additional PCB containing material assessments based on the age of the Library. These assessments were conducted by EFI and Environmental Health and Engineering Associates (EH&E) of Needham, Massachusetts. Based on data from these assessments, PCB-containing caulk was identified throughout the Library, joining several basic building elements, including: CMU; brick; cast-in-place concrete; window casings (metal); window sills (masonry); and metal door casings.

The Cost Removal Alternative Study Program addressed performance of three demolition and segregation alternatives in the PHASE I Area. These alternatives addressed the removal of masonry infill panels and evaluated the cost and time requirements to perform preparation, implementation, and segregation of PCB-impacted masonry from within 12 inches of PCB-containing caulk joints from the remainder of the masonry panel. Addressing the various configurations of the panels, which includes different size windows, a total of 27 exterior panels and 18 interior panels were evaluated.

Prior to the removal of the panels, all interior and exterior PCB caulk throughout the PHASE I Area (as well as the "backer rod" material) within the PHASE I Area was removed and properly managed, including off-site disposal in a TSCA permitted landfill. In addition, the exterior window frames within the PHASE I Area were removed and temporarily stored within the PHASE II Area. Decontamination of the interior door frames (constructed of non-porous metal) is being evaluated based on cost-effectiveness. If the door frames cannot be decontaminated to an acceptable level, the frames will be disposed of in a TSCA permitted landfill. Window frames will be disposed of as PCB remediation, as they cannot be effectively decontaminated for re-use or recycling. This removal and evaluation of the Cost-Removal Alternative Study Program is on-going and is expected to be completed in approximately 10 weeks.

1.3 SUMMARY OF WORK

The intention of the deconstruction is to remove all components of the PHASE I Area including the foundation. With the infill panels removed, there are only five components left to remove: columns; spandrel beams that connect the exterior columns; waffle floor slabs; the foundation walls; and spread foundations. Figure 4 shows an isometric sketch of the components. All of the components are constructed of reinforced concrete. All of these components were cast-in-place with formwork. The top surfaces of the beams, spread footings, foundation walls, and waffle slabs did not require formwork.

The following paragraphs provide an overview of the work and Section 3.0 provides a detailed presentation of the work. Additional details of the work are included in the Contractor's Work Plan attached as Appendix A

There are 77 columns and 65 spandrel beams within the PHASE I Area. 44 exterior columns, one interior column, and 58 perimeter spandrel beams were in contact with PCB-containing caulk. The interface of the infill panels (CMU, brick and/or windows) and the columns and spandrel beams were constructed with PCB-containing caulk, both on the interior and perimeter faces of the building envelope, along the sides and top of the masonry-column or masonry-beam interface. The waffle slabs were not caulked. A comprehensive material testing program identified various levels of PCB contamination within the perimeter columns and beams indicating that PCBs have migrated from the caulk into these materials (see Section 2.0 for more details on the test results).

The impacted columns and spandrel beams will be treated prior to dismantling the structure. The columns and beams will be treated and sealed with a two-part encapsulation procedure. First, a penetrating encapsulant is applied to the concrete anywhere the caulk contacted the concrete material, extending out 12 inches in both directions to provide a wide margin of safety. This application binds the substrate and minimizes the production of dust or a fine powder during dismantling activities. Second, a bridging encapsulant is applied over the same areas to lock-in any potential contamination and create a barrier between the PCB residues and the environment. Both encapsulants will be tinted so that application can be visually confirmed.

The concrete structural components will be dismantled using conventional demolition equipment including hoe ram, hydraulic hammer, grappler, shear, and similar concrete separation device, mounted on conventional long-reach excavator working from the ground. These tools will be used to remove the waffle slabs and to cut beams and columns into manageable pieces. An additional key piece of equipment will be the cranes that will support the members during the dismantling process and for lowering the components to the ground. Wrecking balls and/or blasting will not be used during the dismantling.

The encapsulated columns and spandrel beams will be stored in the PHASE II Area in accordance with the Contractor's Material Lay Out Plan (see Appendix E) to safely spread the load across the floors. The encapsulated columns and beams will be stored on dunnage approximately 12 inches off of the floor in an enclosed, secure environment protected from the weather and unauthorized access.

Although the encapsulants will minimize the release of dust containing PCBs, there is the potential for dust to be generated throughout the dismantling process. Misting will be used to control dust production and will be applied appropriately to reduce the likely of developing pools of water.

Concrete debris generated during the dismantling procedure will be collected. The bottom of the waffle slabs and the majority of interior columns contain low levels of PCBs that are believed to be associated with an alternative source. The majority of these components are more than 5 feet from any PCB caulk joint. The collected debris associated with the waffle slabs and interior columns will be directed onto the adjacent lower floor, transported to the ground, and stockpiled. The material less than 2 ppm will be disposed off site as construction/demolition debris and/or reused and recycled. Although all material is anticipated to contain less than 2 ppm of PCBs based on tests of the waffle slab (see Table 2-7 in Appendix B of the Plan), any waste material that tests above 2 ppm but less than 50 ppm will be disposed at Turnkey's Rochester New Hampshire facility.

During the dismantling process, any concrete debris associated with caulk-impacted members will be collected and packaged for off-site disposal as PCB Remediation Waste. The PCB-impacted columns and beams will be stored temporarily in the PHASE II Area and treated under a separate SIP to be submitted at a later date.

1.4 PROJECT SCHEDULE

The work identified in this Plan is proposed to start 31 days from submission of this Plan on April 22, 2010. Figure 5 presents the Contractor's detailed schedule.

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1.5 REGULATORY FRAMEWORK

This Plan has been prepared to satisfy the site characterization and notification requirements listed in 40CFR§761.61(a). This Plan is specific for and limited to the PCB-impacted concrete structural components found at the Library as noted in the drawings in Appendix C of this Plan.

The caulk and backer rod, if encountered, will be disposed of in accordance with 40CFR§761.62(a). Concrete debris, personal protective equipment, and any disposal tools are considered PCB Remediation Waste and will be managed and disposed in accordance with 40CFR§761.61(a).

As noted in this Plan, the Commonwealth of Massachusetts is the property owner and Salem State University has care and control of the Property. The Division of Capital Asset Management (DCAM) will be overseeing the Cast-in-Place Concrete Dismantling Program with Contractors contracted to DCAM. Two Certification letters, one from each Agency, are provided in Appendix G. The names of the responsible parties are:

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Certified letters have been submitted to the Massachusetts Department of Environmental Protection and to the local Board of Health in accordance with 40CFR§761.61(a)(3)(i). These letters notify these Agencies of DCAM's intention to proceed with the dismantling of the PHASE I Area structural members. Copies of these letters are provided in Appendix F, together with Federal Express tracking information.

2.0 PCB SITE CHARACTERIZATION & EVALUATION

2.1 SITE ASSESSMENT AND SAMPLING SUMMARY

An initial survey to identify PCB-containing materials was conducted by EFI on April 17, 2009. This survey identified caulk that contained levels of PCBs greater than 50 ppm, and supplemental surveys were conducted on December 3, 2009, February 5, and February 26, 2010 to further characterize the nature and extent of PCB caulk in the Library. Table 2-1 in the submitted February 11, 2001 SIP presents the caulk sampling data, together with the sample identification number, and location within the Library (e.g. 4th floor interior window caulk). This table is reproduced in Appendix B of this Plan for convenience and completeness.

On December 2, 2009, January 21, and February 26, 2010 EFI collected core samples of the cast –in-place concrete, brick and CMU materials in representative locations on the interior and exterior of the Library. This sampling was conducted to estimate the extent of migration within the media at several distances from the caulk. Table 2-2 details the data collected from concrete impacted by PCB caulk, and show the lateral migration of PCBs in concrete at various distances from the caulk line (1.5 inches and 3 inches). Table 2-3 presents the data for the concrete samples collected at various depths immediately below the caulk line. Certified laboratory data sheets for all the analyses, including the cast-in-place concrete, are attached in Appendix D.

On April 15 and May 10-12, 2010, EH&E collected additional caulk samples and core samples to further evaluate the nature and extent PCB caulk and residual contamination in the porous substrates. Samples were collected immediately behind the caulk after it was removed. The samples represent porous material collected to a nominal depth of 3 inches from the surface of the test material. Table 2-4 presents the sampling data for the caulk, concrete, CMU, and brick, respectively, although the concrete is the only material subject to this Plan as the CMU and brick were addressed in the SIP, and are provided here for informational purposes only.

On March 31, 2011 EFI collected samples of the waffle slab for PCB analysis. This material was not impacted by PCB caulk. Both the top side and underside of the slabs were tested by sampling the first ½ inch of concrete. Testing the top and the bottom of each slab was deemed important because the underside of the slab was made with concrete forms (and possibly form oil), while the top side of the slab was not exposed to a concrete form.

2.2 DATA EVALUATION

Table 2-5 below summarizes the results from sampling at two distances from the caulk line, 1.5 inches and 3 inches away. This summary was compiled from data presented in Table 2-2 in Appendix B of this Plan. All these samples were collected at a nominal depth of ½ inches from the surface of the concrete, thereby providing information on the lateral movement of PCBs near the surface of the concrete.

Table 2-5 Summary of PCB Residues (ppm) in Concrete by Distance from Caulk Line, Salem State Library, Salem State University, Salem, Massachusetts

Distance from Caulk	N	Min	Median	Mean	75th Percentile	95th Percentile	Max
1.5 inches	26	0.071	0.378	5.02	1.22	10.4	93.5
3.0 inches	12	0.183	0.987	3.19	3.82	13.0	14.2
Samples collected by EFI, Inc., Wilmington, Massachusetts on Dec. 2, 2009 and January 21, 2010. All							

samples collected to a nominal depth of 0.5 – 1.0 inches from surface of concrete.

Aroclor 1254 was the predominant PCB mixture in all samples, with small quantities of Aroclors 1248 and 1260 found in several samples. Aroclor 1254 was the predominant PCB mixture found in caulk.

In summary, the data show that levels of PCBs at both locations (1.5 and 3.0 inches away from caulk line) were very low; nearly always well below 50 ppm, and mostly below 10 ppm. These data show that residual PCBs from the caulk are largely found very near the area where the caulk was applied, generally in the area less than about 1.5 inches from the caulk line.

Table 2-6 below summarizes the data found in Table 2-3 in Appendix B of this Plan. The purpose of this sampling effort was to evaluate how deeply the PCBs penetrated into the concrete matrix, and samples were collected at various depths immediately underneath the caulk once it was removed. The data show that the PCB residues are found very close to the surface of the concrete, generally within the first ½ inch of the concrete. For example, the median value for the first ½ inch was found to be 326 ppm, while the median value collected from the 1.0 -1.5 inch interval was less than 1 ppm (0.529 ppm). These data and the data in Table 2-2 show that the PCB residues are confined to the areas 3 inches away from the caulk line and less than one inch deep into the concrete.

Table 2.6 Summary of PCB Residues (ppm) in Concrete at Various Depths Underneath Caulk, Salem State Library, Salem State University, Salem, Massachusetts

Sample Depth	N	Min	Median	Mean	75th Percentile	95th Percentile	Max
0-0.5 inches	10	6.33	326	341	500	715	745
1-1.5 inches	10	0.060	0.529	0.983	1.32	2.74	3.13
2-2.5 inches	10	0.059	0.152	0.430	0.199	0.959	1.24

Samples collected by EFI, Inc., Wilmington, Massachusetts on February 26, 2010. All samples collected from concrete directly underneath caulk.

The data in Table 2-3 also show that the levels of PCBs found near the surface of the concrete (e.g., less than 0.5 inches) are weekly to moderately correlated with the levels of PCBs found in the caulk directly over that surface (r^2: 0.36). Whereas the PCBs residues found deeper in the concrete were poorly correlated with the levels of PCBs found in the caulk directly over the concrete surface (r^2: 0.04-0.06). This suggests that the influence of the concentration gradient between the caulk and concrete only extends to very shallow depths; generally less than about 1 inch. The PCBs found beyond this interval are likely related to other sources such as form oil (see discussion in Section 2.3 below).

2.3 EXCLUDED WASTE

The following materials have been tested and determined to contain low levels of PCBs (less than 50 ppm) and are considered "excluded products" in conformance with the requirements of 40CFR§761.3, and the rationale for this classification is discussed in the following paragraphs:

1. Asphaltic dampproofing on the exterior foundation wall of the Library
2. Exterior staircase caulking located on the north side of the Library
3. Concrete waffle slabs and interior columns not impacted by PCB caulk

The Library has an asphalt based damproofing around its foundation that contains both asbestos and very low levels of PCBs (5.54 – 15.6 ppm). Samples collected from the top and bottom of the

waffle slabs on every above-grade floor and from interior columns found low levels of PCBs, less than 3 ppm with most results at or less than 1 ppm (ND – 2.68 ppm). Caulking on the exterior stairs of the north elevation was also tested and found to have very low levels of PCBSs (1.3 – 2.2 ppm).

The low-level concentrations of PCB in the dampproofing, waffle slabs, interior columns and staircase caulk are believed attributable to background contamination from the forming and manufacturing processes. The dampproofing that contains PCB concentrations less than about 15 ppm and the caulk, waffle slabs, and interior columns that contain PCBs less than 3 ppm are considered to be Excluded Products as they satisfy the criteria for an "excluded product" as defined in 40CFR§761.3. This determination is made by satisfying the criteria below:

a. the PCBs exist at levels below 50 ppm;

b. the product(s) were legally manufactured, processed, distributed in commerce or used before October 1, 1984; and

c. the resulting PCB concentration is not the result of dilution, or leaks and spills of PCBs in concentrations over 50 ppm.

The data clearly show that these materials contain PCBs less than 50 ppm. The asphalt coating was installed when the Library was built, and represents a standard damproofing application. The caulk, waffle slab, and interior columns were also part of the original building construction. This indicates that these materials were legally manufactured and installed before October 1, 1984. Lastly, the location of the damproofing (outdoors, below grade) indicates that the material was not subject to contamination from any spill or release of PCBs greater than 50 ppm. The waffle slab and caulk were also not adjacent to any source of PCBs greater than 50 ppm, and as such could not have been impacted by a spill or release of PCBs.

The dampproofing material will be handled as an asbestos-containing material and disposed at Waste Management's Turnkey Landfill in Rochester, New Hampshire, a facility that is permitted and licensed to accept asbestos waste and PCB bulk remediation waste less than 50 ppm (although the asphalt dampproofing is considered an excluded product). The staircase caulk will also be disposed at the Turnkey landfill, as it contains levels above the State limit of 2 ppm for disposal in a construction and demolition waste landfill. The waffle slab and interior columns will be disposed in a construction and demolition landfill or processed and recycled in accordance with State requirements.

DCAM provides the following information to further support the conclusion that the residual PCBs found in these materials are the result of the forming and manufacturing process, specifically from low levels of PCBs in oils used in the concrete form oil and in the fabrication of dampproofing and caulk.

The Library was constructed in the early 1970s, a period when PCBs were widely used and distributed in commerce for a variety of purposes. PCBs were used extensively in the electrical industry as a dielectric fluid and in the industrial sector as a heat transfer fluid.[1] PCB fluid used

[1] UNEP. 1999. *Guidelines for the Identification of PCBs and Materials Containing PCBs.* United Nations Environment Programme. First Issue-August 1999. http://www.chem.unep.ch/Publications/pdf/GuidIdPCB.pdf

for these purposes was often collected, mixed with other oil, and re-purposed as a waste or filler oil product, later blended into oil based asphaltic materials, such as dampproofing. For example, PCB-contaminated waste oil was used to control dust on roadways, providing a direct source of environmental PCB contamination.[2]

However, due to the historic practice of blending oil with PCBs, the presence of low levels of PCBs in asphalt is not unusual, not the result of a spill or release, and were from products that were legally manufactured and used in commerce. Therefore, the presence of PCBs in the dampproofing and caulk satisfies the criteria of an "excluded product" and is specifically excluded from this Plan.

These re-purposed PCB-containing oils were also used in creating mineral oil release agents (MRAs), explaining the inadvertent contamination of forming oils with PCBs.[3]

In cast-in-place concrete fabrication, several different types of form oils are used to prevent the setting concrete from adhering to the form into which the concrete is poured. Barrier form oil is one type of release agent used in fabrication. Barrier-type form oils (non-reactive) work by creating a physical/chemical barrier between the form and the fresh concrete. The form oil is sprayed, brushed, or mopped onto the surface of the form. Diesel fuel, heating oil, paraffin, waste, used or recycled motor oil, lubricating oils, and greases are just some examples of oil products and by-products that are used as barrier type form release agents. These materials are commonly used because they are readily available and inexpensive to purchase.[4] The form itself can be made of various different materials including metal, plastic, and fiberglass. Direct transfer of the oil (and its constituents) to the surface of the concrete is likely under these conditions, as the forms remain in-place for several days or weeks as the concrete sets and cures.

Form oil consisting of mineral oil and waste oil (including PCB residues) was commonly used in the concrete industry during the period when the Library was built. A barrier type of form oil (MRA) was likely used due to its popularity, satisfactory results, and inexpensive purchasing price for a non-critical application (i.e., insensitive to staining or other aesthetic imperfections from the form or release agent). And, since PCBs were found in mineral oil based release agents, it is not unusual to find residual levels of PCBs in the surface of concrete, as documented in the sampling results presented in the Plan.

The data from the waffle slab provides further evidence for form oil as the source of low levels of PCB residues. The bottom of the slabs would have been formed in the field with forms and form oil. Comparatively, the top side of these slabs would not have been formed or treated with form oil; instead they would have been "floated" or leveled. While all the samples found very low levels of PCBs, in general, the levels found on the underside of the waffle slab were slightly higher than the levels found on top side, where no form or form oil would have been used.

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[2] EPA. 1979. *EPA Bans PCB Manufacture; PHASEs Out Uses;* U.S. Environmental Protection Agency. Press Release April 19, 1979. http://www.epa.gov/history/topics/pcbs/01.htm

[3] Redrock. 2004. *Workers' Health and Safety Issues Connected to Release Agents*, Accessed January 11, 2011. http://www.redrock-uk.co.uk/benefits.html

[4] Olympic. 2011. Technical Bulletin # OPP-TB-9712: "Form Oil/Release Agents". Olympic Panel Products. Shelton, WA Accessed January 11, 2011. http://www.olypanel.com/common/pdf/Form%20Oil%20Technical%20Bulletin%20-%209-07.pdf

Due to the previously mentioned conditions that indicate similar concentrations of PCBs present in the concrete, it is apparent that the presence of PCBs are not a result of a single incident, more likely, a uniform use or application of a product, such as that during the forming of the cast-in-place concrete. The exact source of the PCBs in the concrete waffle slab at the Library cannot be definitively determined. However, due to the historic use of waste oil or low cost oil to make form oil, and the fact that these oils frequently contained or were blended with PCBs, the presence of low levels of PCBs in cast-in-place concrete is not unusual, not the result of a spill or release, and were from products that were legally manufactured and used in commerce. Therefore, the presence of PCBs in the waffle slab and interior columns satisfies the criteria of an "excluded product" and is specifically excluded from the Plan.

3.0 SCOPE OF WORK

3.1 GENERAL WORK APPROACH

The scope of work for this Program is limited to the materials in the west section of the Library, as noted on Figure 3, in order to complete the demolition of this section of the building.

Prior to demolition, the encapsulated columns and beams that were in contact with PCB caulk will be treated with a two part encapsulation procedure. A penetrating encapsulant will applied to the concrete within 12 inches of the caulk joint(s) to bind the concrete and residual PCBs. This will effectively minimize the production of fine dust during the removal of the PCB-impacted column or beam. Next, a bridging encapsulant will be applied to the same area on the concrete, sealing the areas with PCB residues in the concrete and isolating it from the environment.

The structural components will be dismantled using a hoe-ram, hydraulic hammer or similar concrete separation device, mounted on long-reach excavator working from the ground. Starting at the roof level and moving down the building on a floor-by-floor basis, the roof or ceiling will be demolished and allowed to collect onto the floor below. This material is not impacted by PCB caulk, and will be temporarily stockpiled and then pushed down the waste material chute that will be constructed in the southwest mechanical chase. Material that contains PCB concentrations greater than two ppm and less than 50 ppm will be disposed in the Turnkey landfill located in Rochester New Hampshire. Materials that are less than 2 ppm will be disposed as construction and demolition debris or recycled in accordance with State requirements.

The general work sequence for the columns, beams and floor can be summarized as follows, progressing bay-by-bay until a floor is complete, then moving down to the next level. A bay is defined as four columns, associated spandrel beams and the concrete waffle slab within that rectangular area:

The following is excerpted from section 3.2 of the Contractor's Work Plan (see Appendix A) and summarizes the planned work sequence:

1. Ensure windscreen and debris netting on outboard side of the scaffolding is in place and properly secured

2. Ensure that 10-mil plastic reinforced sheeting is in place on scaffolding floors and properly lapped to the edge of the building to contain any debris that may fall to the outside of the building

3. Install OSHA compliant guard rails along column line 4 on the Drawings, at the PHASE I and PHASE II interface and in any other applicable areas

4. Removal of rubber roof and roof beams

5. Removal of piping and other items in the shaft, and replacement of previously removed panel walls with temporary barriers so that it can be used as clean demolition debris chute

6. Demolition of 4th floor ceiling (roof) slab, likely starting at northwest corner, progressing southeasterly, subject to adjustment by project team

7. Movement of debris out of building by bobcat via Southeast demolition chute for temporary stockpiling outside the building, ensure that all concrete from the concrete ceiling deck (roof), which has not been in contact with PCB caulk, has been removed from the demolition work area on the 4th floor prior to proceeding with the next step

8. Encapsulation of all perimeter concrete on columns and spandrel beams that contacted PCB caulk using a two-part tinted encapsulant to bind the concrete and seal the surface

9. Installation of engineering controls for the selective demolition of encapsulated concrete, such as 10-mil poly drop cloths and debris collection chutes (supported by crane or scaffolding) and receiving containers (wood bins covered with plastic), underneath areas where selective demolition of will occur on the encapsulated concrete columns and spandrel beams.

10. Safely position personnel to mist spandrel beams and columns

11. Once all controls are in place, completely expose the reinforcement bars (rebar) of the spandrel beams where they connect to the adjoining columns using a hoe ram/hydraulic hammer or similar device, note that the hoe ram/hydraulic hammer and any other non-porous items that come in contact with encapsulated concrete will be decontaminated prior to use on waffle slabs and interior concrete columns in subsequent areas

12. Packaging of all concrete debris, disposable personal protective equipment (PPE), and other disposable items, such as poly sheeting that have been in contact with PCB's for disposal as PCB Remediation Waste; ensure that demolition area is clear of all concrete debris prior to proceeding to the next step

13. Cut rebar with a cutting torch or chop saw, as necessary. The spandrels will be cut adjacent to the columns, and they will be supported by a sling and crane during this work to prevent it from falling

14. Completely expose rebar at the base of a column using a hoe ram/hydraulic hammer, perform decontamination, support column with crane and sling, cut rebar with torch or chop saw, as situation requires

15. Encapsulated perimeter columns and spandrel beams, once separated from the building, will be moved into PHASE II Areas of the building and stored according to the Contractor's Material Layout Plan (see Appendix E)

16. Ensure that work area is free of all debris prior to any work being performed on the concrete waffle slabs (ceiling and floors) and the interior columns (decontaminate equipment, collect and package all PCB-impacted concrete debris, as described above)

17. Perform demolition of interior columns and waffle slab within a "bay". Lower the columns to the ground using crane and sling, push the waffle slab and other debris down the demolition chute for stockpiling

18. Move to the next bay, following the same work sequence until the entire floor has been dismantled and demolished

19. Remove the scaffolding down to the next floor level

20. Upon completing all of the floors, proceed with demolition of the foundation of the PHASE I portion of the building

21. Removal of masonry that was in contact with PCB caulk associated with the Meier Hall connector, using the procedures detailed in Contractor's PCB Impacted Caulking and Masonry Plan contained with the SIP submitted on February 11, 2001 and revised on April 4, 2011.

22. Once all the concrete/masonry that was in contact with the PCB caulk has been removed from the Meier Hall connector, perform the demolition of the Meier Hall connector and move the material to the stockpile area

3.2 ASPHALT DAMPPROOFING

The asphaltic dampproofing located on the outside of the north, west and south foundation walls and on the spread footings of the Library will be removed under a MADEP-approved bulk removal plan and disposed at the Turnkey Landfill in Rochester, New Hampshire. As noted in Section 2.2 of this Plan, this material is considered an excluded product and is not subject to the requirements of 40CFR§761.61 or 40CFR§761.62 and related sections.

3.3 ENVIRONNMENTAL PROTECTION AND CONTROLS

The purpose of the work covered by this addendum is to complete the demolition of the west section (PHASE I) of the Library. No on-site remediation of the contaminated porous surfaces is contemplated or specified in this Plan, thereby minimizing the potential for release of PCB residues from the materials. Further, the selected removal methods are designed to minimize any potential release by encapsulating the areas of the components that contacted the PCB caulk with a tined encaspulant and/or using controlled demolition methods to remove the encapsulated materials, and the work will be sequenced to minimize the possibility of mixing the PCB remediation waste and the construction and demolition waste streams. All PCB bulk product waste (caulk, if found) will be removed in advance of any demolition work to avoid potentially releasing the caulk and caulk residues into the environment.

3.3.1 Inspection Criteria

As part of the remediation process, verification that dismantling has been properly completed and meet the acceptance criteria described in this section will be required at the Library. Prior to dismantling any PCB-impacted material, the presence of an encapsulant as specified shall be field verified. Debris containment measures shall also be verified prior to dismantling the encapsulated columns and beams. Periodic inspections will be conducted to insure that PCB Remediation Waste and debris is properly contained and packaged for disposal, and is segregated from the construction and demolition debris.

3.3.2 Dust Control Measures

During all activities at the Library, dust control will be a key component to mitigating exposure

of students, faculty, visitors, and neighboring residents to potential contaminants associated with the Library. Methodologies that require significant additional control measures will be considered less advantageous than an alternative that minimizes dust generation.

Encapsulated concrete will be segregated and packaged in dust and water-tight containers at the demolition site to minimize potential dust generation during movement of the materials to temporary storage areas and to vehicles for off-site shipment. Chutes will not be used to transport PCB remediation debris to the ground, they will only be used to collect the debris as it is generated and to direct this material to next floor level for packaging as PCB remediation waste.

Please refer Appendix F of the Contractor's Work Plan, located in Appendix A of this Plan, for the Contractor's Dust Control Plan.

3.4 ENVIRONMANTAL MONITORING

3.4.1 Particulates/Dust

Although the dust control activities summarized in Section 3.3.2 above, are considered more than adequate in dust control, ambient air monitoring will be conducted on the perimeter of the Project Site. This monitoring will be used to verify that the dust suppression measures are correctly working and to provide documentation that particulate releases to the ambient air have not occurred. The perimeter monitoring will be conducted at one upwind location and two downwind locations. These monitoring locations may be modified at the start and at the halfway point of every work day depending upon weather and site conditions.

Real-time particulate monitoring will be conducted on a daily basis on all days that dismantling of the concrete components is conducted at the Library. Particulates/dust concentrations will be recorded over 15 minute averaging periods for each day using three (3) Model 8520 TSI DustTrack Aerosol Monitors with Environmental Enclosures. The data logger will record a measurement every 5 minutes as well as perform the 15-minute averaging. All perimeter dust monitoring will be collected from the breathing zone at the heights described above for dust monitors. (i.e. at a minimum of fifty four inches (54") and a maximum of seventy-two inches (72") above the ground level). Table 3-1 provides additional information on the ambient air monitoring for particulates.

Meteorological information such as wind speed and direction will be obtained (via weatherbug.com) from a weather station located at the Saltonstall School located approximately 0.7 miles north of the Library.

For each day of monitoring, the particulate data from the downwind units will be initially compared with the data from the upwind (background) unit. In the event that upwind monitoring exceeds data from the downwind monitors, a new action level for the downwind units will be used. This new action level will be 120 ug/m^3 plus the upwind unit's reading. The Consultant will monitor the upwind unit and will reduce downward the action levels if the upwind units indicate a reduction in the upwind dust.

The average 8-hour PM_{10} concentrations for the Site monitors will be compared to the Project specific notification level of 120 ug/m^3 – which represents 80 percent of the 24-hour USEPA National Ambient Air Quality Standards (NAAQS) for PM_{10} (NAAQS =150 ug/m^3). If dust

concentrations exceed this level, work will stop until additional dust suppression measures are implemented (e.g. water misting, erection of additional wind barriers) and the monitoring data indicates the required reduction of particulates in the ambient air.

3.4.2 Asbestos

Air monitoring in the perimeter air and work zone will also include monitoring for airborne asbestos fibers during removal of the foundation dampproofing only as this material has been documented to contain asbestos fibers above one percent. Low volume battery-operated pumps will be used to collect samples for on-site PHASE Contrast Microscopy (PCM) analysis in accordance with NIOSH Method 7400. All perimeter air samples for asbestos will be collected from the breathing zone at the height described above for dust monitors. The action level for implementation of additional controls is 0.010 fibers/cm^3. If the Action Level is exceeded, work will be temporarily stopped and additional wetting will be performed or other dust suppression methods will be implemented until levels are below 0.010 fibers/cm^3. Air monitoring will consist of two (2) rounds of four (4) samples per round per 8-hour work period.

Analyses of air samples for asbestos will be performed on-site so that corrections in the work practices can be made immediately. If the air monitoring results exceed the Massachusetts Division of Occupational Safety's clean air criteria of one – one hundredth fiber per cubic centimeter (0.010 f/cc) of air, then all work will stop. The work methods will be evaluated and modified prior to continuing further work. All air monitoring will be performed by consultants who are properly trained and licensed in the Commonwealth of Massachusetts as Asbestos Project Monitors. All sample analyses will be performed by consultants who are properly trained, are participants in the American Industrial Hygiene Association's Asbestos Analytical Registry (AIHA's AAR), or alternatively, who work for a laboratory, which is licensed by the Commonwealth to perform such analysis and is accredited with either the AIHA or National Voluntary Laboratory Accreditation Program (NVLAP).

In addition to the perimeter monitoring, the Contractor will be responsible for personal worker sampling for their employees as outlined in OSHA Asbestos Construction Standard 29 CFR 1926.1101. Personal samples will be collected to check personal exposure levels for the purpose of establishing respiratory protection needs. Samples shall be taken for the duration of the work shift or for eight hours, whichever is less. Personal samples will be collected on the first day of demolition activities and must be taken every time there is a change in the removal operation, either in terms of the location or the type of work. Sampling will be performed to evaluate eight-hour Time-Weighted-Averages (TWA). If the airborne fiber concentrations reach or exceed the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) of one-tenth fiber per cubic centimeter (0.1 f/cc) of air, then work will stop.

Air monitoring and sampling is summarized in Table 3-1.

3.4.3 PCB Air Monitoring

Perimeter (fence line) air monitoring will be conducted at the Library during dismantling activities to assess concentrations of polychlorinated biphenyls (PCBs) in the outdoor air. Dust concentrations will be collected with real-time instruments to establish the applicability of using real-time dust concentrations as an immediate proxy for PCB concentrations. The objective of this monitoring plan is to document the effectiveness of control measures by measuring ambient

PCB concentrations at the perimeter of the fence line for the work zones.

Because analytical methods used to analyze PCBs require approximately 15 business days or the laboratory to process and release the sample results, analytical results for PCBs will arrive well after the work has been completed. Using a real-time proxy will therefore allow the project team to adjust work controls should a rise in particle concentrations be attributed to the dismantling work. PCB sampling and analysis will be conducted following EPA Method TO-10A. Air sample analysis for the PCB homologs will be conducted by Alpha Analytical of Westborough, Massachusetts.

The proposed fence line monitoring will occur in addition to engineering, containment, and work sequence controls. Together these controls have been developed to control PCBs associated with this project to the maximum extent possible.

During dismantling of the PCB-impacted columns and beams, upwind and downwind perimeter (fence-line) PCB air monitoring will be conducted at a frequency of once per week. The sampling frequency will be adjusted as necessary based on previous sample results and proximity of the dismantling work to sensitive areas (entryways and/or air intakes). EFI, with the concurrence of the project team, will determine the exact placement of monitoring based on construction schedules and planned activities. However, it is generally anticipated that PCB air samples will be collected in the same locations as the particulate air monitoring stations. A monitoring technician will be present full-time during each monitoring day.

3.5 CONTINGENCIES

The only potential contingency anticipated on this project is the discovery of hidden PCB-containing caulk. If caulk is found, demolition work will stop and the caulk will be removed and packaged for disposal as a PCB Bulk Product Waste, in accordance with 40CFR761.62. Any porous material in contact with the caulk, and 12 inches in all directions from the point of contact, will be encapsulated as described herein, and removed and stored in PHASE II Area, following similar work procedures described for the PCB-impacted columns and beams.

A second contingency is the potential for encountering asbestos-containing and PCB-containing parging material. The parging material is an asphalt-based damp-proofing material that was observed by EFI at the structural relieving angles and a copper flashing material between CMU/concrete walls/structural members and the brick veneer of the building and it contains PCBs in concentrations between 6.66 and 88 ppm (see Table 3-8). Based on the planned demolition, it is unlikely that the work will encounter this material. However, if encountered, copper flashing materials coated with parging will be removed and packaged for disposal as a PCB Bulk Product Waste in accordance with 40CFR§761.62. CMU material with parging residue will be removed and packaged for disposal as a both an asbestos-containing material and PCB Remediation Waste. Prior to storage in the PHASE II Area, parging will be removed from concrete structural members, packaged, and disposed as a PCB Bulk Product Waste in accordance with 40CFR761.61. Areas where parging was encountered on concrete structural members will be coated with the tinted two-part encapsulation method as described in Section 3.1.

4.0 VERIFICATI0N INSPECTION AND SAMPLING

4.1 VISUAL INSPECTION CRITERIA

4.1.1 Pre-demolition Inspection

Prior to the demolition work, the works areas will be inspected to insure that the perimeter columns and beams are encapsulated, and that the appropriate containment measures are in place to capture and encapsulated debris, as detailed in the Contractor's Work Plan attached in Appendix A. The presence of environmental protective and dust control measures will be confirmed prior to dismantling the encapsulated concrete. Any deficiencies will be corrected before the demolition work begins.

4.1.2 Post-demolition Inspection

Prior to demolishing a bay on a floor, the area will be reviewed to insure that encapsulated concrete columns and beams have been removed, and the encapsulated rubble and debris has been contained, packaged for disposal and moved out of the PHASE I Area. This will be done a floor-by-floor basis to insure that the clean and PCB-impacted waste streams remain segregated. In addition, the general work area will be inspected for evidence of fugitive debris from the demolition activities, and any material that may be PCB-impacted will be noted and cleaned up by the Contractor as treated as PCB remediation waste.

4.2 MATERIAL SAMPLING

All PCB-impacted material, including concrete debris, personal protective equipment, and disposable tools and equipment will be disposed of PCB remediation waste in accordance with 40CFR§761.61(a) at a TSCA-approved landfill. All PCB-impacted concrete columns will be temporarily stored in the PHASE II Area for treatment, testing and disposal at a later date, under a separate submission to the EPA. No decontamination of PCB-impacted materials will be covered by this Plan, and as such, verification sampling is not required.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL

No additional data (excluding air monitoring) are anticipated to be collected for the work covered by this addendum. Encapsulated concrete that contain residues of PCB will be temporarily stored in the PHASE II Area for treatment at a later date under a separate submission to the USEPA. Any PCB-impacted debris (encapsulated concrete), personal protective equipment, and disposable tools will be collected and disposed as a PCB remediation waste over 50 ppm at a TSCA-approved landfill. Decontamination will not occur under this Plan and all PCB-impacted materials will be disposed at a TSCA-approved landfill. Therefore, remediation verification sampling is not required for the work, other than the waste characterization sampling performed as required by the disposal facility and their operating permit.

If for any reason, verification sampling is deemed necessary, it will follow the quality control and assurances procedures detailed in the Cost Removal Alternate Study Program SIP, dated February 11, 2011, and revised April 4, 2011.

6.0 WASTE MANAGEMENT

6.1 ON-SITE MANAGEMENT

All solid and liquid waste streams will be managed in accordance with applicable regulations and policies of federal and state environmental agencies. The Contractor has developed a waste stream management plan that clearly outlines procedures for tracking waste streams, required enclosures, etc. Temporary Storage Areas for the encapsulated and PCB-impacted columns and beams have been proposed by the Contractor in the PHASE II Area on each floor (see Appendix E). As these columns and beams were sealed with an encapsulant, the remaining PCB residues are not directly exposed the interior environment of the PHASE II. In addition, the PHASE II Area is protected from weather (e.g., rain, snow) and is secure to prevent unauthorized access. Details regarding the location(s) and lay out of the PCB-impacted columns and beams will be developed by the Contractor and evaluated and approved by a structural engineer licensed in the Commonwealth of Massachusetts The Area will be placarded as containing PCB waste with markings meeting the USEPA requirements of 40 CRF§ 761.40 and §761.45.

If encountered, PCB-containing caulk will be double bagged, containerized and labeled as "PCB Bulk Product Waste". Containers are 55-gallon steel drums. Similar containers will be used for co-mingled asbestos and PCB-containing caulk, and temporarily stored in the Temporary Waste Storage Areas designated in the Plan for this purpose.

All personal protective equipment (PPE), containment materials, filters, particulates, and equipment that cannot be fully decontaminated, will be managed as PCB Remediation Waste with levels greater than or equal to 50 ppm. PCB waste containers for these materials will be placed in the Temporary Waste Storage Area.

All stockpiles and containers will be clearly labeled and situated such that the contents of a waste stream do not come into contact with the contents of adjacent stockpiles or containers.

All PCB Bulk, PCB Remediation, asbestos waste, non-impacted materials, and incidental remediation waste and materials will be removed from the Building within 90 days of generation. Movable equipment and other non-porous materials will be cleaned in accordance with 40CFR §761.79(c) (2).

The PCB-impacted concrete columns and beams will be treated, tested, and disposed under at a later date, under a separate submission to the USEPA, within one-year of removal from in accordance with 40CFR§761.65(a).

The Contractor's Work Plan, included in Appendix A of this Plan, provides a detailed description of the storage container, transport containers, means of handling, transport and disposal of waste as required in the specification.

6.2 TRANSPORTATION

Transportation of the each waste stream will be performed in accordance with all applicable US Department of Transportation (DOT) regulations and will be placarded accordingly. Transporters will have valid MassDOT Transporter identification numbers to allow transport of the applicable waste stream. All operators of the transportation subcontractors will be licensed to transport the applicable waste stream.

Documentation for each waste stream is required by regulations and policies of the applicable regulatory agency with jurisdiction. Hazardous waste manifests, Material Shipping Records, and Non-Hazardous Waste Manifests will be appropriate for the identified waste streams.

PCB Bulk Product Waste and PCB Remediation Waste cannot be disposed within the Commonwealth of Massachusetts. As such, the waste will need to be transported out-of-state to an approved TSCA-permitted landfill. Documentation for transport of these wastes will be Hazardous Waste Manifests.

Materials whose PCB concentrations are less than 50 ppm but greater than 2 ppm will be disposed out-of-state at the Turnkey Landfill in Rochester New Hampshire. Documentation for transport of these wastes will be Non-Hazardous Waste Manifests and/or Material Shipping records. Material less than 2 ppm will be disposed as construction and demolition waste or recycled, in accordance with applicable State requirements and the landfill or recyclers operating permit. The majority if not all the concrete not in contact with the caulk will likely meet the less than 2 ppm requirement.

6.3 OFF-SITE DISPOSAL

All PCB remediation and demolition waste, and PCB Bulk Product Waste (if any) will be removed from the Library for disposal off-site in accordance with the Contractor's Work Plan in addition to applicable state and federal regulations and sent to a TSCA landfill facility that will receive and retain the PCB Bulk Product Waste, if any, in accordance with EPA regulations and the Specification. Waste disposal will be in accordance with applicable state and federal regulations. This includes 40 CFR §761.61 or §761.62

Approximately 100 tons of PCB remediation waste is anticipated to be generated during the work including encapsulated concrete debris, personal protective equipment, and disposable tools and equipment.

Approximately 2,450 tons of concrete with PCB concentrations less than 50 ppm is anticipated to be generated during the work, and primarily includes waffle slabs and interior columns that did not contact PCB caulk.

All interior columns and waffle slabs that comprise the ceiling and floors do not contact or contain PCB caulk and will be recycled and/or reuse in accordance with MADEP Solid Waste Regulations. MADEP has requirements that masonry and concrete that are coated with damp-proofing, paint, etc, require additional testing and analyses to demonstrate that material can be reused/recycled without posing harm to human health and the environment.

Copies of all hazardous waste manifests, bills of landing, waste shipment records, and certificates of disposal will be provided to the University, USEPA and MassDEP as proof of proper disposal.

7.0 REFERENCES

EPA 40CFR PART 761--POLYCHLORINATED BIPHENYLS (PCBs) MANUFACTURING, PROCESSING, DISTRIBUTION IN COMMERCE, AND USE PROHIBITIONS. *Code of Federal Regulations.* Title 40, Part 761. Washington, D.C: U. S. Environmental Protection Agency.

OSHA 29 CFR 1910. Occupational Safety and Health Standards – General Industry. *Code of Federal Regulations.* Title 29, Part 1910. Washington, DC: U. S. Occupational Safety and Health Administration.

OSHA 29 CFR 1926. Occupational Safety and Health Standards - Construction. *Code of Federal Regulations.* Title 29, Part 1910. Washington, DC: U. S. Occupational Safety and Health Administration.

U.S.EPA. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846). Washington, D.C., U.S. Environmental Protection Agency. (http://www.epa.gov/wastes/hazard/testmethods/sw846/online/index.htm)

APPENDIX A

CONTRACTOR WORK PLAN

APPENDIX B

DATA TABLES

APPENDIX C

FIGURES AND PLANS

APPENDIX D

LABORATORY REPORTS

APPENDIX E

CONTRACTOR MATERIAL LAYOUT PLAN

APPENDIX F

STATE AND LOCAL REGULATORY NOTIFICATION

APPENDIX G

OWNER'S AND RESPONSIBLE REMEDIATION PARTY CERTIFICATION

APPENDIX H

SAMPLE LOCATION DRAWINGS